Requirement for top bracing application

<table>
<thead>
<tr>
<th>No. of Cyl.</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral stays</td>
<td>B *1 / A *2</td>
<td>B *1 / A *2</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Longitudinal stays</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

Remarks:
A. The countermeasure indicated is needed.
B. The countermeasure indicated may be needed and provision for the corresponding countermeasure is recommended.
C. The countermeasure indicated is usually not needed.

*1 for standard rating fields (n_max ≤ 76 rpm)
*2 for extended rating fields (n_max ≥ 76 rpm)
Requirements for specification of hydraulic stop attachment points

- The selected stops must have owners' acceptance for the size engine installation, which approval supplier: Den-Ocean Technology Co. Ltd, Harb-Hydraulic Marine Co. Ltd (Korea) Harby Marine Mfrs. Co. Ltd (Korea)
- Installed on exhaust side (ES)
- The amount of stops must be determined based on the requirement and stops suppliers' specifications. The transferred forces must be taken into consideration. The engine frames and members are divided in the relevant engine dynamic state sheet form 54M.80.2.1.00 if the data is used in the Marine installation Manual (MIM)
- Stop pre-loading forces mean the stop hydraulic forces must also be considered and seen provided by the stop supplier.
- The stop attachment joint requirements must be comprehensive with the specification. The maximum forces transferred by the selected stops must be within the range as define on the drawing for standard engine installation. If the total force per stop exceeds the permissible range, the performance of the platform attachment points can be reduced from the engine builder
- The stops must adapt to the ship hull deformation and reduce the static reaction force acting on the engine and stop hull attachment points
- The stops must resemble the fatigue strength of the system to withstand extreme conditions. The dynamic stiffness of the stop dynamic loading table is provided by the stop supplier.
- The stops must dampen accordingly to ensure that the acceptable vibration RMS limit for the Wärtsilä 2-stroke engine system
- The performance of the stops must be tested during the trial by vibration measurements
- The installation and commissioning of the stops must be in accordance with the supplier's instructions.
Requirements for application of hydraulic stays on fuel side:
- The selected stays must have the approval of the engine supplier.
- The installation is to be done by the engine supplier.
- The installation shall be in accordance with the engine manufacturer's instructions.
- The layout and specification of the stay shall be as per the manufacturer's recommendations.
- The stay shall be designed to withstand the loads and forces acting on it.
- The stay shall be capable of withstanding the maximum permissible force in the specified direction.
- The stay shall be capable of withstanding the maximum permissible displacement in all directions.
- The stay shall be capable of withstanding the maximum permissible angular displacement.
- The stay shall be capable of withstanding the maximum permissible vertical displacement.
- The stay shall be capable of withstanding the maximum permissible horizontal displacement.
- The stay shall be capable of withstanding the maximum permissible angular displacement.

Only for 11 and 12 cylinders.
### Requirements for application of hydraulic spring on fuel side AND exhaust side

- The selected springs must have the supplier's acceptance for both side engine installation.
  - WNQ approved supplier: Great & Plain Technology Co., Ltd. (Korea)
  - Marine Hydraulic Machinery Co., Ltd. (Korea)

- Installed on fuel side (FS) AND exhaust side (ES).

- The amount of springs must be determined based on the requirement and supplier's specification.

#### LAYOUT I SPECIFICATION OF SPRING ATTACHMENT POINTS ON EXHAUST SIDE

<table>
<thead>
<tr>
<th>No. of Cyl.</th>
<th>Engine type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>3 x MT150MP</td>
<td>735</td>
<td>892</td>
<td>617B</td>
<td>780C</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3 x MT180MP</td>
<td>735</td>
<td>892</td>
<td>617B</td>
<td>780C</td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>12</td>
<td>3 x MT200MP</td>
<td>735</td>
<td>892</td>
<td>617B</td>
<td>780C</td>
<td></td>
</tr>
</tbody>
</table>

- The selected springs must be determined based on the requirement and supplier's specification.

#### LAYOUT I SPECIFICATION OF SPRING ATTACHMENT POINTS ON FUEL SIDE

<table>
<thead>
<tr>
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<td></td>
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</tbody>
</table>

- The selected springs must be determined based on the requirement and supplier's specification.

#### MAXIMUM PERMISSIBLE FORCE IN PLURAL DIRECTION

<table>
<thead>
<tr>
<th>F(x)</th>
<th>N(kN)</th>
<th>±200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- The maximum permissible force in plural direction must be within the range as defined on the drawing for standard engine erection. The loads force per spring must be in the permissible range. Reinforcement of the platform attachment points can be requested from the engine builder.

- The springs must be safety checked to the safety factor and static reaction force acting on the engine and side of attachment points.

- The springs must increase the total stiffness of the system to avoid harmful resonance conditions. The dynamic stiffness of the springs is provided by the springs supplier.

- The springs must be tested according to the supplier's instructions.

- The springs must be checked during sea trial by vibration measurements.

- The installation and commissioning of the springs must be in accordance with the supplier's instructions.
MIDS - WinGD X92DF - Engine Stays (DG9715)

TRACK CHANGES

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<th>DATE</th>
<th>SUBJECT</th>
<th>DESCRIPTION</th>
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<td>DRAWING SET</td>
<td>First web upload</td>
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<td>2019-08-16</td>
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<td>Arrangement drgs – new revisions</td>
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<td>2020-02-24</td>
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<td>Main and system drgs. – new revision</td>
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